

Mathematical Student Motivation

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Abstract

The research project will be conducted with a target focus group of six students who have been identified as struggling students in 3rd grade mathematics. The research project will study the effect of using different teaching strategies and methods to increase motivation and focus among these students. The research project will be conducted at Greenfield Elementary School beginning in September 2011 and data collection will continue through the end of November 2011. The data tools consisted of: student goals, student interviews to discuss student goals, colleague collaboration, student interviews discussing engaging learning opportunities, anecdotal records, student test scores, student journal observation, student surveys and professional learning communities with various colleagues. This research project is being conducted due to the fact that many struggling mathematical students have difficulty with motivation and focus in their learning of basic math concepts. It is desired to understand what strategies will increase their motivation and focus and thus inspire them to be more successful in their learning of mathematics.

Introduction

Greenfield Elementary School is one of eight elementary schools located in an upper class wealthy district in the suburbs of Michigan. The actual location of our school is on the verge of a lower class suburb, and an upper to middle class suburb. This creates a variety of socio-economic status among students as well as a culturally diverse group of children and families. We have two preschool programs of three and four year old students, a preschool autistic classroom, a cognitively impaired classroom, two sections of all day Kindergarten, a tuition based Kindergarten enrichment program, three sections of first grade, three sections of second grade, two large sections of third grade, three sections of fourth grade, and three sections

of fifth grade. We have a music teacher, gym teacher, orchestra and band teacher ,optional for fifth grade students, art teacher, two special education teachers ,with various para-professionals, a reading specialist, a reading recovery teacher, a Title One Math Teacher, as well as an instructional specialist. We also have a speech pathologist, a school psychologist, a social worker, and a school counselor, who are all shared among other buildings in the district. Our school is most known for recently receiving the National School of Character Award (2008). This award is given to schools with outstanding character among students and staff, and was given based on a site visit, as well as an application and portfolio that explained our character education program at length.

This is my sixth year teaching at Greenfield Elementary. Currently, I am the Title One Mathematics support teacher. I support students who struggle with mathematics concepts in grades second through fifth grade. This is my first year as the Title One Math Support teacher. I was previously a classroom teacher in Kindergarten, fourth grade, and second grades.

I believe that students who are motivated and focused on their learning have the potential to be successful academically. If every student was focused and motivated to try their best then learning math concepts would come easier. In my experiences with teaching lower performing math students, I have found that there is a lack of motivation and focus, thus leading to misunderstanding, or no understanding of the concepts being taught. The purpose of my action research project is to research and learn about best practices, which will increase motivation and focus among students, while I also can learn ways to utilize these practices to enhance enthusiasm in mathematics. The research and data collected will allow me to analyze my current teaching practices and allow for changes, or additions to my teaching methods in order to best meet the needs of my students. All research and data collection will be completed with third

grade students. The research will be implemented into a small group intervention mathematics program with third grade students. The action research project will begin in September of the 2011-2012 school year, and will continue through January 2012. Because of this time frame, I will be able to show the growth of students over time.

Area of Focus Statement

The purpose of this study is to research best practices to increase motivation, and lack of focus among lower performing third grade math students, and to learn and utilize these best practices to increase enthusiasm and focus in mathematical learning.

Research Questions

1. What learning strategies will increase focus and good work habits?
2. What is the effect on students' focus and motivation when different opportunities for learning are provided (i.e. projects, collaborative groups, manipulatives, reciting concepts to music, oral presentations)?
3. What teaching practices and strategies could improve student motivation, focus and the learning of mathematical concepts?

Definition of Variables

According to Mills in (2011) *Action Research: A guide for the Teacher Researcher*, “a variable is a characteristic of your study that is subject to change. That is, it might be the way you are going to change how you teach, the curriculum you use, and student outcomes” (p.61). Below shows a list of characteristics of the action research plan subject to change throughout the project.

1. Currently, the action focus group consists of a group of third graders who are receiving math support services. Next year, this group of students will be fourth graders, so the focus group will consist of different students.
2. Teaching assignments in the building will change next year. Currently, much assistance is given to the general education teachers when teaching math. The new teacher assigned to third grade next year, may wish to change the teaching methods currently in place.
3. The curriculum (Everyday Mathematics) will remain the same. Although, assessments, and assignments will be modified in order to best meet the needs of the students. Also, teaching methods may be changed according to a specific concept, or a particular student and their learning ability.

Review of Literature

Anderson, M. (2011). *Educational Leadership Magazine: ASCD Express, Volume 6, Number 15.* (p.1-2). Alexandria, VA, ASCD.

This was a brief article suggesting that using special projects for learning helps students experience curriculum in new and engaging ways. This was chosen because best practices sometimes include creating different ways to present and assess students. For students who lack focus and motivation, creating a special project related to learning math could provide them with a way to relate to the content more, thus be more focused and motivated to learn and succeed. Being a Title One teacher and having more freedom with time and extra assignments, this idea could be feasible for use with the group of students for the action research project. Anderson (2011) suggested ideas that could be used “create and play board games that incorporate math skills, make posters or picture books to explain an operation, such as multiplication” (p.2). This author has created a challenge for incorporating new ways of teaching. This could be a very

positive way to increase motivation and effort among low performing math students. Offering projects that extend mathematical learning can also be engaging, and interesting to students.

Blomster, E. (2001). *Educational Leadership Magazine: November 2001, Volume 5: Number 3*. “Unlocking motivation: The key to success”. (p. 30-33). Alexandria, VA. ASCD.

This article discussed a very important idea that relates to the action research project: apathy. The students of the action research focus are very apathetic to their mathematical learning. The author of this article gives promising practices of how to start the year with motivation and how to maintain it throughout the year. She begins the year with a classroom survey that she gives to students. This is similar to the survey that will be used for students in the action research project. After the survey, the author explains that she was able to compile the results and decide how to best teach to students' interests while also including a “fun atmosphere” (p.30). The author, Elizabeth Blomster, also began her school year teaching her students about creating a respectful environment, what it looked like in the classroom, and what their classroom environment of respect would consist of. This idea relates to a bias that was mentioned for the action research project. By creating a respectful environment in the intervention classroom that is separate from the general classroom, the students will understand their expectations in the math classroom. By beginning the year with these boundaries, they may be able to separate their expectations in their general classroom to their intervention classroom. This is a practice that will be used in the action research project. Blomster goes on to explain the importance of modeling, motivation, and optimism, as well as creating meaningful opportunities for learning (real-life problem solving, and relating learning to situations students may encounter). She ends her article with a very important quote: “motivation is not always something that can be directly observed or

measured, but it can be encouraged. We, as educators need to motivate and encourage all students to succeed. Motivation is the key!” (p.33). This article gives ideas through the lens of the author, although provides promising practices that can be used in the action research project.

Burns, M. (2008). *Educational Leadership Magazine: Best of Educational Leadership 2007-2008. "Nine ways to catch kids up"* (p. 16-21). Alexandria, VA. ASCD.

This article explains strategies for helping children understand math concepts who seem to be lacking in their basic understanding of mathematics. This is seen through the eyes of the author, but she gives personal explicit examples of instances with students and how she can prove that they lack basic mathematical understanding. It does not just provide the author's opinion of an interaction with another student; it states the exact conversation with a student and goes into further detail of how to better teach this student for better understanding. Also, the author and her colleagues collaborated on creating this set of strategies in her building and they all applied it successfully, based on increased assessment scores.

This article supports the action research focus because learning better practices are the ultimate goal in the end. The author goes on to explain different strategies that can be used with a similar student. One particular strategy that can be applied to personal teaching is using the “think-pair-share strategy, called turn and talk” (Burns, p.18). This is something that is familiar in the writing and language arts areas. Using it for mathematics is something that is new. This could be a helpful practice that can be applied for providing an engaging environment, but also bringing students to focus, because there is a task that is required of them to perform and listening to the content and focusing on what is expected of them is necessary.

Checkley, K & Willis, S. (1996). *Educational Leadership Magazine: Summer 1996. "Bringing mathematics to life"*. (p. 56-63). Alexandria, VA. ASCD.

This article does not meet the criteria for being less than ten years old, but does offer very promising practices specific to the mathematics classroom. The author explains that real-life lessons and problems need to be given to students in order for them to relate to the concepts and apply their knowledge later on. Checkley and Willis state that, “Mathematics ‘makes sense’ to students when lessons draw real-world connections...to ‘experience’ math, not just memorize it, and to know where they will use the math skills they are learning” (p.56). These are important ideas to use for the action research project. Teaching lower performing, unmotivated students, requires grabbing their attention and providing explanations about why they need to learn certain concepts. This way, they will connect more with their learning, and will understand why and how to apply these concepts in their direct experiences. Checkley and Willis explain various ideas for students to relate to their learning of math concepts. Some of these ideas include: using a recipe for teaching fractions, using manipulatives for teaching geometry, creating a sledding contest to test which sled is the fastest and creating number models to test, using the newspaper for snowfall totals, or prices for items for estimation of total costs, and also embedding literature into mathematics. Checkley and Willis state, “when students try to solve application problems, they must think about what they’re doing. They’re not just putting pencil to the page without understanding” (p.58). This is an important notion to remember for the action research project. By allowing students to learn concepts, but then directly applying them to their daily lives creates a more engaging and fun environment, allows children to be more focused and motivated for learning. They will be more included to learn and listen to content, if they are aware of how this can be applied to their lives later on. Finally, the author tells us that involving writing with mathematics is important because it allows students to articulate their thinking for problem solving. This is a wonderful idea; although will not be used for the action research project

because many of the students who are struggling math students are also struggling reading students and this idea would be of frustration to them. This article is beneficial to the action research project because it is very specific to providing strategies for use in the mathematical classroom.

Gurule, K. (2007). *Educational Leadership Magazine: December 2007, Volume 65: Number 3.* “Making math count—problem solving time”. (p. 20-23). Alexandria, VA. ASCD.

This article uses a population that is very similar to that of the action research project population. The study was conducted with a Title One school, whose mathematics test scores were significantly below the state standards. The author and her colleagues created time every morning to collaborate about how to better teach their students in mathematics. They decided on setting aside time each day to problem solving. This way, they explicitly taught their students this process step-by –step. The author explains that especially word problems were difficult for their students. This is similar to a problem in the action research project target group. The curriculum used for the action research project has many problems that are language based. These are often difficult for struggling students. An idea that can be applied to the action research project is “read the problem, circle what the problem was asking them to do, and underline the important information that would help them solve the problem” (Gurule, p.20). Gurule, also stresses the notion that for change to occur “it takes time” (p.23). Through collaboration and work among grade level teams this study showed improvement in students’ test scores. This information is helpful for the action research project in that the realization that collaboration is important as well as being patient with the fact that change in students and their abilities will take time and effort.

Katz, M. (2011). "Success In math for the child with ADHD". Retrieved May 12, 2011
From: Internet Resources for Special Education. Website: www.iser.com.

This article discusses students who have Attention Deficit Hyperactivity Disorder and how to best teach them for success in mathematics. The action research project group of students has some who have Attention Deficit Hyperactivity Disorder, some who are medicated for this, and others who are not. Strategies are discussed in this article to best serve students with this disability. One strategy or practice that can be applied to the action research project is creating a vocabulary list, or notebook of mathematical skills. Often times, vocabulary words are written on the board and discussed, but having an actual card, or list with explanations to refer back to would be a possible beneficial strategy to use with lower performing math students. Also, a concept mentioned in this article was: creating tasks that are broken down into steps, where there is a specific sequence to the steps that students follow. This helps in the anxiety of a multistep problem. Children with Attention Deficit Disorder disability have trouble sitting for long periods, and this is a known fact. At times, this can be easily forgotten because of curriculum that needs to be covered in short periods of time. Keeping this fact in mind and using Katz's suggestion of "providing short breaks" is something that will be used in the action research target group.

Scherer, M. *Educational Leadership Magazine: September 2002, Volume 60: Number 1.*
"Who cares? And who wants to know?" (p. 1-5). Alexandria, VA. ASCD.

This article discusses data that indicates that students' mathematical abilities are decreasing, as they get older. It shows trends that United States students are one of the lowest performing students on math assessments the older they get. The author explains in order to increase the abilities of students we must motivate them to take learning into their own hands.

The article is brief and states a website that gives more in depth articles for strategies and practices that could be of use for the action research project. The website is:

www.whatkidscando.org. This website could be a great tool for creating meaningful lessons and engaging activities, but could also provide a good resource for students to access individually for ideas about improving their learning, or for words of encouragement about mathematics from other peers across the country.

Silver, H & Strong, R. & Thomas, E. *Educational Leadership Magazine: February 2004, Volume 61: Number 5. "Creating a differentiated mathematics classroom".* (p.73-78). Alexandria, VA. ASCD.

This article begins with stating two books that describe teaching using differentiation in the mathematics classroom. One of the books, *Classroom Instruction that Works* (Marzano, Pickering, & Pollack, 2001) is a book that I have had experience using, but it was a few years ago. I can use it for reference in attempting to differentiate instruction in my classroom. The article goes on to explain it is important to understand students' mathematical learning style, and then it will be easier to teach to their levels. This is something I have never thought when teaching math. This could be applicable to the action research project. The authors state, "these different mathematical learning styles provide a map of cognitive diversity among mathematics students. Understanding these styles helps teachers address students' strengths and weaknesses as learners" (p. 3). After determining a students' mathematical learning style, it is suggested to create a classroom that will enhance each students' learning style. An important idea to take away from this article for the action research project is to understand that students do learn differently, and to create an environment for their different learning styles. I can reference Marzano's book as well as determine learning styles (according to criteria stated in the article) and further motivate and focus my students.

Tomlinson, C. (2010) *Educational Leadership Magazine: February 2010: Volume 67: Number 5*. "Meeting students where they are: One kid at a time". (p. 12-16). Alexandria, VA. ASCD.

This article explains what the author says is, "personalized instruction" (p.12). She states differentiated instruction is similar, but "personalized instruction is when an individual student signals an opportunity for enhanced learning and the teacher seizes that opportunity. Personalized instruction often provides important lessons that alternately affirm and challenge what we think we know about effective teaching. It improves the quality of our teaching as it improves the quality of learning for the student who, at least for a time, does not fit the mold" (p. 13). This notion is very crucial to the action research project. As unmotivated and unfocused lower performing math students, moving from differentiated instruction to personalized instruction and teaching to students interests is a very interesting idea. The author goes on to explain a personal experience with a student who enjoyed comics, and how she tied this interest into his learning. She goes on to explain other situations of students whom she worked with that really benefited from teaching using their interests. This article is beneficial to the action research project in the fact that personalized instruction is important and crucial to include teaching to students interests, although, it did not give specific examples of strategies used in the mathematical classroom. The personal stories told, with successful endings were motivational using personal interests into teaching, but these were not instances for teaching mathematics specifically. The importance of interests in teaching for motivation and focus were strong points of the article that can be applied to the action research project.

Willis, J. (2010). Learning to love math: Teaching strategies that change student attitudes and get results "Chapter 1: Reversing Math Negativity with an Attitude Makeover." Alexandria, VA. ASCD.

This article begins with an explanation of why math is often viewed with a negative attitude. Statistics are given regarding this fact. Also, directly related to the action research project, are indicators that occur with students in the target group. Willis (2010) explains these to include “stress, low motivation, decreased levels of participation, boredom, low tolerance for challenge, failure to keep pace with class lessons, behavior problems, and avoidance of the advanced math classes necessary for subsequent professional practices” (p. 1). The author goes into detail about stress and how if a student is stressed with their abilities in math then basically they shut down mentally and do not focus on their learning. This is a fact that is known, but in the target group for the action research project different factors are evident: indifference, apathy, and lack of motivation. This part of the article does not directly relate to the target research group, but supplies important information if there were a student who had math anxiety. Willis explains that promoting a positive attitude is most important to show students that their abilities matter. Willis tells us, “when you increase your students’ positive feelings toward mathematics, you unlock their brains’ math-blocking filters, promote long-term memory, and foster greater understanding beyond rote memorization” (p.5). She explains strategies for promoting positive thinking associated with math. Many of these ideas begin with modeling, as well as showing the relationship of math in real world situations. These are strategies that will be used for the action research project. This article is based on data findings as well as strategies put into action with support on success. This will be beneficial to the action research project.

Description of proposed intervention or innovation

I will implement the Everyday Mathematics curriculum, when needed with modifications, by using hands-on, interactive, real-world, authentic tasks, and manipulatives

through ideas learned in research, to promote motivation and focus among lower performing third grade math students.

Resources Needed:

1. Everyday Mathematics Curriculum Third Grade
2. Possible Funds for purchasing more manipulatives.
3. Possible funds for purchasing supplies for using and creating Math Workshop centers.
4. Folders for daily work, spiral notebooks for math journals, dry erase markers, and a continued subscription of Everyday Mathematics Games Online will be needed for the action research project.

Research Process

Research Questions	1	2	3
What learning strategies will increase focus and good work habits?	Student Goals	Student Interview	Colleague Collaboration
What is the effect on students' focus and motivation when different opportunities are provided?	Student Interviews	Anecdotal Records	Test Scores
What teaching practices and strategies could improve student motivation, focus and the learning of mathematical concepts?	Student Journal Observation	Student Survey	Professional Learning Community

The data collection matrix represents the research questions to be considered during the action research plan. For each question, three different methods will be used in order to obtain information. From these results, specific teaching practices will be applied in order to best suit the needs of students. As Mills' (2010) states in (2011) *Action Research: A guide for the Teacher Researcher*, "teachers have always reflected in their teaching before, during, and after a particular teaching episode-it's part of our professional disposition. Action research is no different. We can and should take time to analyze our data during the study to decide if what we are learning is what we had hoped to learn" (p.124). From using professional learning communities, as well as personal colleague interviews, and incorporating research driven practices it is the goal that these different methods will serve as a reflection upon current teaching practices and will either change in ways to best meet the needs of students, or will be modified in order to meet the goals of the action research plan.

The first research question will require gathering data from student goals, student interviews, and information discussed in colleague collaboration. The students will write personal goals at the beginning of the year. These goals will be guided and modeled through a brainstorming activity. They will be recorded in a student notebook. Students will set a learning goal for themselves and will check in with their progress of the goal periodically to see how they have progressed. Students will discuss their goal with me, in a student interview, and will decide how they are progressing on their goal throughout the year. Finally, colleague collaboration will occur with the third grade general education teachers. This is to gain further ideas about students and how they best learn. Also, thoughts can be shared among colleagues for teaching methods and practices that have been both positive and negative for students and their learning.

For research question two, showing the difference in providing engaging learning opportunities as opposed to just modeling and independent learning, using raw data scores on math assessments will be necessary. This is because in order to show improvement over time when providing different learning opportunities, it must be evident in the overall math assessment scores as compared to times of learning when these opportunities were not provided. Teacher observation will be conducted during learning and these observations will be recorded in a teacher notebook for summarization at a later time. This will be beneficial to note the differences in students' learning when engaging opportunities are provided. Finally, student interviews will be given to determine why specific learning opportunities are positive experiences for students and also to gain "on-the-spot" answers from students.

Research question three will require results gained from the student survey as well as observations of the student math journal. Students will write in their math journal at varying times throughout their learning. Summaries of these journals (written in the teacher notebook) will be necessary in order to understand students and their initial experiences following a lesson. The student survey will also provide student opinions about math and ways in which math is best learned for each student. Lastly, a professional learning community discussion will occur with the instructional specialist, to discuss findings at the math workshop conference, as well as other ideas that may be used with students to increase motivation and focus in math. Ideas will also be shared with teachers who also work with the target group of students in a before school program called GPAS (Greenfield's Program for Academic Success). This meeting is meant to help to coincide teaching methods in both the small group math class time, as well as during their GPAS class. This way students will be introduced to the same content multiple times, in multiple ways.

As Dorothy Korzum tells us in the *Expert Commentary Teachscape Video: Data Analysis and Interpretation*, “data analysis and interpretation is the most cumbersome and challenging part of the action research project. This is the time where you must “look for patterns, and themes, and find ‘the what’ of your data analysis.” From the information gained through the student surveys, student notebooks, interviews, colleague collaboration, teacher notebook, math scores, and professional learning communities, the answers will be useful in obtaining information about how students best learn, what their strengths and weaknesses are in math, as well as how I can best teach students according to their needs. In creating another matrix similar to Appendix C (p. 236) in Mills’ (2011) *Action Research: A guide for the Teacher Researcher*, and using color coded highlighting in the matrix to identify changes in attitude over time in student surveys and parent surveys, results can be obtained regarding patterns and themes over time. This is why it will be crucial to not only offer the survey to students at the beginning of the year, but at the mid-year time, and again at the end of the year. Also, scores on math assessments can be recorded on a bar graph to show an increase or decrease in scores according to the application of engaging learning techniques versus just teacher modeling and independent practice. This way, it will be understood if practices have been beneficial to students and their learning of mathematics.

Interpreting scores will be evident through a bar graph, and through observation of students. If students are performing well on assessments, then their morale and self-confidence will be higher, and thus they will be more motivated and focused during instruction. It is the hopes of providing engaging learning opportunities as well as using student surveys and interviews, colleague collaboration, student notebooks, and anecdotal summaries completed in a teacher notebook, to understand interests and personal aspects of students to best reach them and their

potential for learning. Understanding that this is the hardest and most challenging part of the action research project, it is going to be a trying process, but through careful planning and deliberate use of methods explained above, the action research questions will be answered, supported with proper data, and organized for best understanding of data collected.

Data Analysis

1. What learning strategies will increase focus and good work habits?

Source 1: Student Goals

Student goals were written in order for students themselves to be more motivated toward individually improving upon something in the mathematical area. Student goals were written in September 2011. The reason for creating a goal was so students would have something to work towards and improving upon. With a goal set, students could be more motivated to work towards succeeding in a specific area (determined themselves), and would thus be more inclined to try harder, and do more practice to reach their goal.

Each student was able to create a goal based on what they wanted to improve upon in their mathematical learning (see Appendix C). The students were encouraged to choose something they felt they could put in extra effort to practice, and something that was a reachable goal for them. Individual students were met with and were able to verbally discuss their goal, as well as write it in their math notebook. One hundred percent of the focus group chose multiplication facts as their area of improvement. Forty percent of the group, in addition to learning and becoming better at their multiplication facts, also chose improving on their tests as part of their goal. A pretest of fifty multiplication facts was given to students to see where they were in their completion of facts. All students scored about a fifty percent, and the goal of this

pretest is to give another test (post test) in November to see if students have made progress for their goal.

Based on student goals, I was able to modify my teaching practices so I could assist students in their practice. I was able to include fact practice (at least five minutes daily), into our small group learning time. I was able to provide interactive experiences for students, by doing flashcards with a friend, completing facts on a computer based program, or website, as well as using manipulative based materials to practice and reinforce learning of basic multiplication facts. I was also able to confer with classroom teachers, and use studyguides and practice tests to create an interactive study session for students to prepare for a math test. Problems were discussed with classmates, written and solved using white boards, students were able to use manipulatives, as well as using interactive real world problems so students could relate more to the content they were going to be tested on. Because the focus group consists of lower performing math students, I was also able to allow them more time to take a test in a small group setting, which allowed them to feel better about themselves in testing situations, as well as remove them from classmates who may be finishing tests sooner than they are. Creating student goals helped students be focused on specific goals to work on individually, as well as made them more motivated and focused on succeeding in mathematics.

1. What learning strategies will increase focus and good work habits?

Source 2: Student Goal Evaluation

Student goals were evaluated by conducting a verbal conference with the teacher in November 2011. This is the end of the first marking period and students had their parent – teacher conference as well as having received their report card. At this time, reviewing the progress of the goal was most appropriate in order to see what students had been doing on their own time to improve upon, or reach their goal. The following questions were asked to the focus

group: "What have you done since September to work on your goal? How has this helped you or not helped you accomplish your goal?" After conferring with each student individually and orally discussing progress of their goal as well as writing their planned progress in their math notebook, it was evident all students in the focus group had practiced individually and showed they were motivated to do so. The affect was positive and they were proud of themselves for the work they had done. All students, (100%) stated they have been doing some sort of practice to help them improve in their intended goal statement. Another multiplication fact test was given to check if students have been improving on their basic facts. Multiplication was the chosen fact test because 100% of the case study group chose this area for improvement. All students made progress, or improved from the pretest given in September.

Based on this information, the learning strategies implemented with the focus group during the months of September through November proved to be motivating for students as well as provided students with a good model for positive work habits in their learning of multiplication facts. Not only did all students improve on their goal, they admitted to practicing on their own time. Students stated the strategies used in the small math group setting (flashcards with a partner, website practice, and musical recitation of facts) had also been used at home. These strategies were discussed with students in their evaluation conference with the teacher (see Appendix D). Fifty percent of students used a computer based program at home to practice, twenty percent used flashcards for practice, and thirty percent of students used practice packets provided from the teacher to practice memory of their facts. All students increased in their memorization of math facts, and improved upon their goal set in September. This information concludes all students in the target research group have been motivated to succeed in math and have increased their work habits (studying math facts) in order to do so.

1. What learning strategies will increase focus and good work habits?

Source 3: Colleague Collaboration

Colleague collaboration was completed with the third grade teachers. We were able to discuss strategies that work well for struggling math students. As a team, we were able to brainstorm a list of strategies that collaboratively we could use with this targeted group of students (see Appendix E). After attending a workshop based on the Response to Intervention Model, ideas were added to the list, as well as also presented to the team of intervention teachers who work with the target group before school as all teachers who work with the target group of students were using the same strategies in their teaching. Mainly, the list included using more interactive methods of presenting mathematical information to students. Promethean board lessons, musical activities involving the recitation of math facts, hands-on activities using manipulatives, partner cooperative learning involving math concepts, as well as fact based technological computer games all proved to be highly motivating to students. This was discussed at length during the colleague collaboration meeting. Specific lessons were discussed and the specific progress of the target students for the research project.

All of the students in the target action group proved to be doing better mathematically based on using these interactive methods. This was proved by an increase in math test scores, and overall student report when learning math. Students seemed happier, more engaged, and thus were more motivated to participate and learn the concept at hand. Not only were students being introduced to math concepts in their small group work time, they also had these interactive experiences in their general math classroom. Because of this consistency, students seemed to be more motivated, overall, in math, which allowed them to have more positive work habits when engaging in learning opportunities.

2. What is the effect on students' focus and motivation when different opportunities are provided?

Source 1: Student Interviews

Student interviews were conducted as a follow-up to the teacher collaboration meeting. This was to gain further insight from students themselves about the different activities when using more interactive methods. From the student interviews, 100% of the target group agreed with feeling better about their math learning, and also feeling more motivated to try their best when these activities were provided for them. A checklist was made (Appendix F) and the list was then read orally to each student in their private interview. For each activity, I was also able to put a star next to the top three activities students felt helped them feel the most successful in math, and allowed them to feel more inclined to try harder and strive to be successful. From this list, the top three activities that proved to be the most popular in the target group were: interactive Promethean board lessons (100% of the group chose and their top three), manipulative based learning (100% chose as their top three), and musical based learning (100% chose as their top three). Finally, I was able to ask students how they rated their overall focus during an interactive lesson as opposed to a lesson taught using direct instruction. The focus group all agreed (100 %) that they were more focused during an interactive lesson. Another very important aspect learned from the student interview was how students thought they were progressing on their unit math tests. I was able to ask them, as a part of the interview, if they felt the interactive methods of teaching used were helping them be more successful on their math tests. The focus group (100%) all agreed in their personal opinion, they felt they were, in fact, performing better on assessments because of their interactive learning environment.

These three opportunities for learning are offered for students weekly in their small group math learning session, as well as in their general classroom. Again, with the consistency of student learning using interactive methods, and using methods they personally feel are

motivating, it proves to overall motivate mathematical learning, and promote focus among lower performing math students.

2. What is the effect on students' focus and motivation when different opportunities are provided?

Source 2: Anecdotal Records

Anecdotal records were kept weekly after a small group time math class period. At the beginning of the year, direct teaching, and much modeling were conducted in order to establish routines, as well as for me to be able to gain insight about each student and their learning style. Students overall attitude as well as their focus was not good at this time. Many reminders for participation were required, as well as frequent redirection for excessive talking and being off-task during an independent work time. This was noted in the teacher anecdotal record log.

As the beginning few weeks progressed, and students were more familiar with my rules in the classroom as well as what was expected of them in my classroom, it seemed their overall focus and motivation were improving with the more hands-on opportunities I was able to provide for them. I began to include manipulative based learning (using base 10 blocks and money manipulatives) and students seemed to be more focused on the task at hand as opposed to their previous nonproductive social behaviors. This change was more evidently noted with the Promethean board lessons started in mid October. From this overall experience, it was noted students were much more focused on the activity when they knew they were able to have a chance to come to the board and complete part of a problem in front of classmates. Not only were they more evidently motivated, but students were more on task and focused, knowing there could possibly be an interactive lesson that day.

As the months progressed and even more interactive and engaging activities were provided, the focus and motivation among the target group further increased. With partner work, computer based learning, and musical opportunities available to students, their motivation and

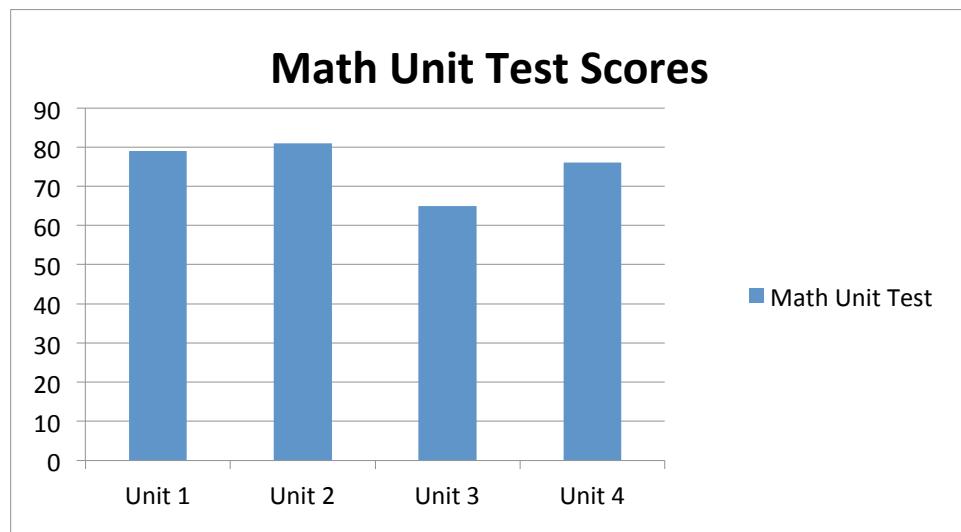
strive to be more focused increased. Mid-October through the end of November, students continued to be more engaged in learning, more on task, and overall more happy and willing to participate. Non-biased anecdotal records were important in order to gain this knowledge over time. Also, it was important to note the differences between the beginning of the year teaching style (direct teaching and modeling) to the mid-year time (engaging learning, with interactive opportunities).

2. What is the effect on students' focus and motivation when different opportunities are provided?

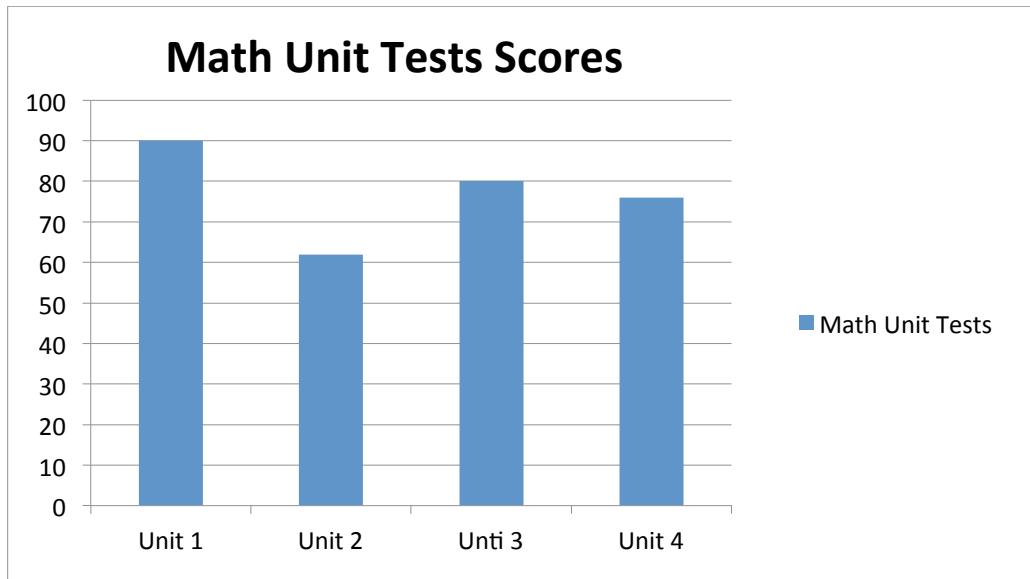
Source 3: Test Scores

Students in the target group for the research project took unit tests in their general classroom from the material learned in their general classroom, as well as what was practiced and reinforced in their small math group, and their before school math class. The scores from their unit tests (one through four) have been recorded and put into a bar graph (see individual student data below). This shows the increase or decrease of each student over time, from test to test.

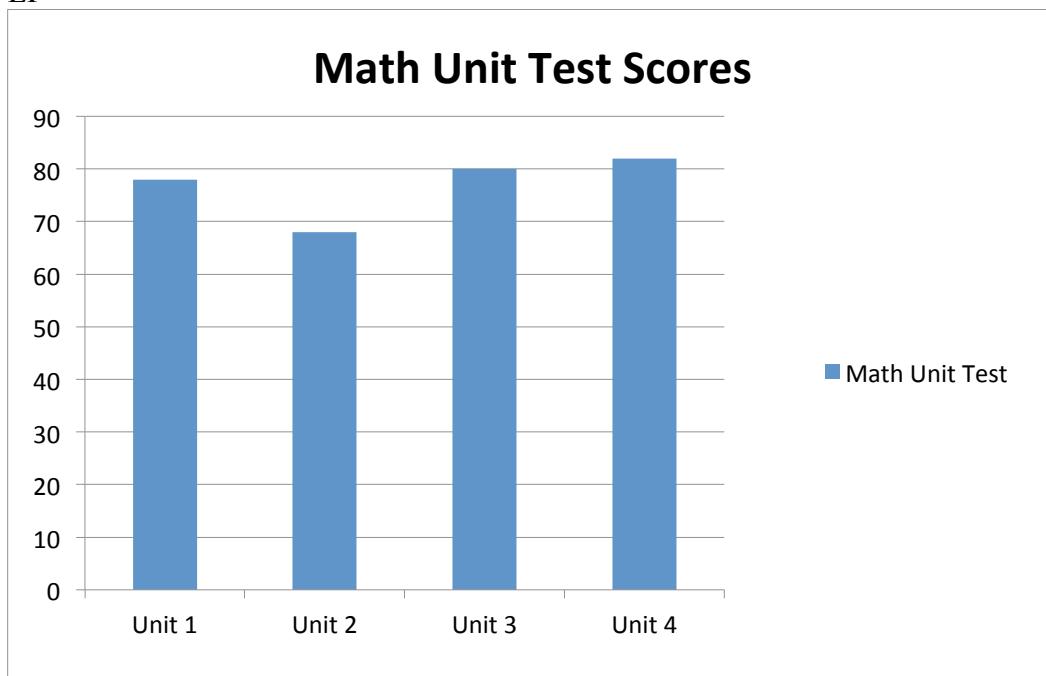
JB



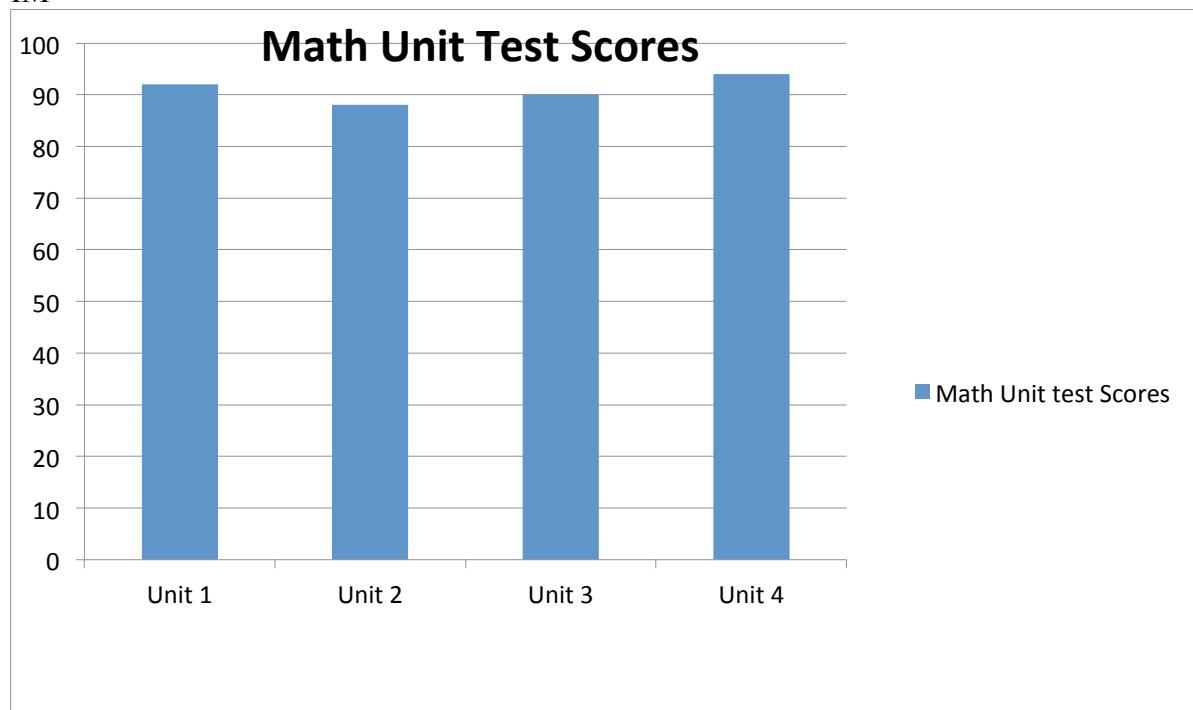
FJ



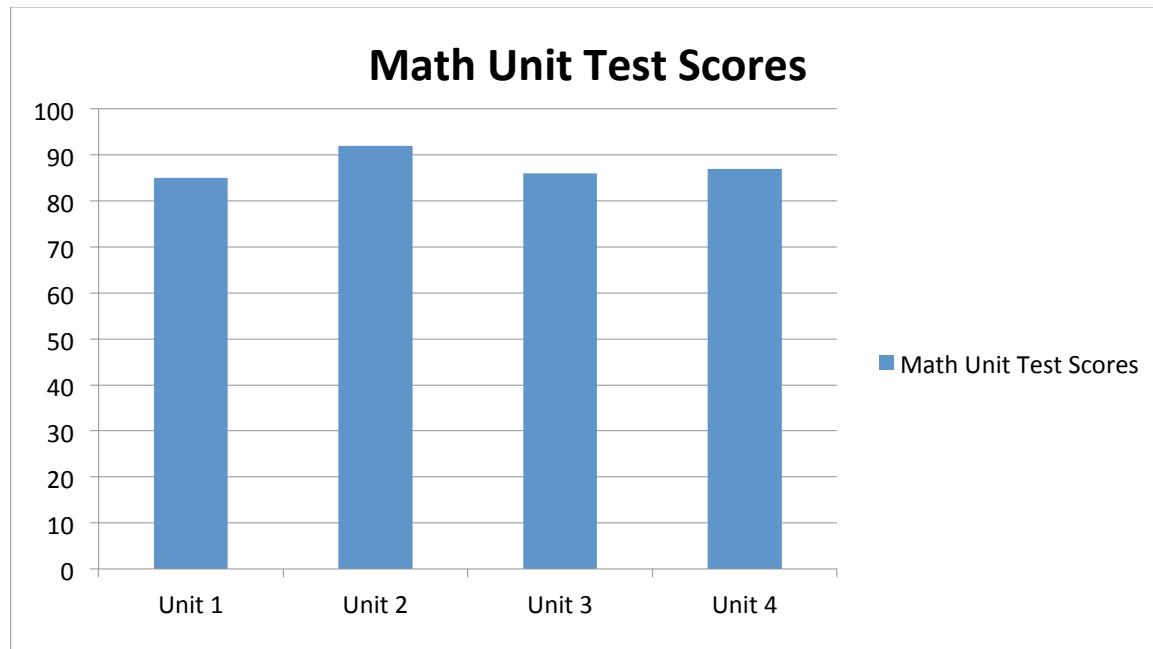
EF



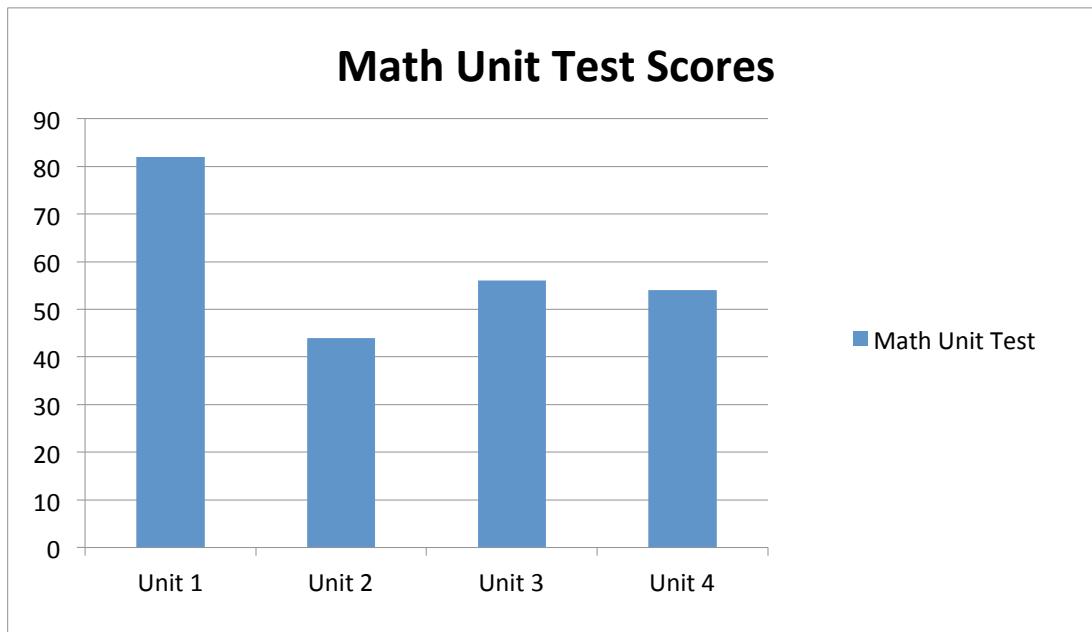
IM



TL



GT



Fifty percent of students (3 out of 6) stayed in the above seventy percent range on their tests. Their averages from test to test fluctuated, but still remained in the above seventy percent range. Thirty three percent (2 out of 6) of students were scoring always in the 80-90% range, while their scores also fluctuated; they remained in the higher percentile of scores on every test. About 17% (1 out of 6) of the target student group scored higher (80% range) on the first test, and then scored decreasingly on the following tests. This student is an English Language Learning student, and does have much support outside of school.

The second test (unit 2), after discussion with third grade classroom teachers, was a difficult test. This test involved the mastering of four concepts (estimation, triple digit subtraction and addition computation problems, and measuring). The teachers in third grade, shared with me the majority of their class had trouble with this unit test. The results from the target group also showed this decrease. This was the lowest scoring test for 100% of the target group.

Interactive study sessions were given before tests for the target group. These sessions involved using the Promethean board for interactive practice of problems students would see on their upcoming test. Also, collaborative partner games were offered to students to discuss and problem-solve example test problems with classmates. Through the use of interactive learning, students proved to perform better on their assessments. With the exception of one student who is English Language Learning, 83% of the target group is scoring above the 70% range on their assessments. For struggling math students who have extreme difficulty with math concepts, scoring in this range is very good. The bar graph of data from the assessments shows this increase, and the student checklist information from the student interview show a positive correlation between interactive learning, and an increase in student motivation and focus.

3. What teaching practices and strategies could improve student motivation, focus and the learning of mathematical concepts?

Source 1: Student Journal Observation

Students in the target group were given a math journal to use during class times. This journal was to be used for reflection of concepts related to math, problem solving, and any written notes they wanted to write to help them with their understanding of math concepts. Student goals were also written in the student journal. Students were excited to have a personal journal, and enjoyed using them during class time. I was able to observe their journals to further understand how they were using their writing to better understand math.

One hundred percent of the target group used their journal for problem solving mainly. This means they were writing out problems, and showing their work for solving the problem. Fifty percent of the target group added notes to their explanations of their problems, with words to help them better understand the process of what they were doing in the problem. This was a strategy I encouraged students to use. Reflections were done in the student notebook weekly.

This asked students to write about how they thought they were doing in math for that week.

They were asked to rate themselves weekly (on a scale of 1 to 5, 5 being the highest) of how they thought they did with understanding of concepts for the week. One hundred percent of the target group scored themselves a 3 or higher each week, for their progress. I also asked them to list their favorite activity completed that week involving math. This could be something completed in their general math class, and in their small group math time. One hundred percent of the group stated they felt an interactive lesson was their favorite each week. Each student stated a partner-based activity, a technology based activity, a musical based activity, or an interactive white board activity as their favorite.

Conclusions can be drawn from student notebook observation, in that all students feel more successful in math when interactive and hands-on opportunities are provided for them. Their opinion can vary from concept to concept, but overall, the general attitude is students feel more successful and more motivated to try their best when they have a chance to explore and manipulate math concepts.

3. What teaching practices and strategies could improve student motivation, focus and the learning of mathematical concepts?

Source 2: Student Survey

A student survey was given to all students in the target research group in September 2011 (Appendix B).

This survey was to evaluate students and their feelings associated with math. Fifty percent of the target group felt “ok” about math, and 50% of the target group felt “not so good” about math. This information was expected from this group. Most students, who struggle in a concept, will tend to have negative feelings about it. Eighty-three percent of the group “likes working with a partner” and 83% of the group also “likes working by themselves”. This could be based on a

specific math concept. Some students could feel successful working with a classmate in one concept, but just as successful working alone for another math concept.

The most important piece of information gleaned from the student survey was the answer to the question, "How do you best learn math?" different choices were provided for students to circle, and 100 % of the group circled all of the choices. The choices included: "watching and learning the teacher solve problems, partner work, using manipulatives, and using what I know". These results were an interesting idea to me. From this information, I was able to look at the ways in which I was presenting information to my students. I was able to gather that I need to do my best to provide all of the opportunities listed on the survey for learning for my students and provide a variety of these opportunities. In order for my students to feel successful in math, I must provide them with ample engaging activities. Finally, direct teaching is important for students. This is so they may see a correct method for solving a problem. I will still plan on using direct teaching and modeling, but will keep these instances to a short time in order to gain focus, good listening and work habits among students. Student surveys are a wonderful way to gain insight about how students feel about a given subject area. They are able to truly share students' feelings about a concept or idea and allow students to feel validated in helping to choose activities to target their best ways of learning.

4. What teaching practices and strategies could improve student motivation, focus and the learning of mathematical concepts?

Source 3: Teacher Professional Learning Community

A professional learning community meeting was scheduled with the instructional specialist in October 2011. The instructional specialist at Greenfield Elementary works with struggling students as well as enrichment students. Her position is for helping teachers to use curriculum and teaching methods to best serve students. The goal of this meeting was to discuss

instructional methods to be used with struggling students in math. A before school program (called GPAS- Greenfield Program for Academic Success) was established last year for struggling math and reading students. This year, the instructional specialist and I were hoping to coincide my small group math program with the GPAS program so struggling math students were being introduced to the same concepts in multiple ways, and from different teaching professionals, while all methods were meant to best meet student needs and interests.

The October meeting involved creating a curriculum reference notebook for the GPAS teachers to use. The instructional specialist and I felt struggling math students needed consistency in their learning of math concepts and by creating a curriculum notebook, both the GPAS teachers, and I were using together, the students would be presented with mathematical information in multiple ways, but also in ways motivating for them. I was able to discuss the information gleaned from the student survey, the student interview, as well as the student goal-setting interview with the instructional specialist, and we came up with the items for the reference notebook. This notebook consisted of test reviews, actual unit math assessments, interactive teaching methods, websites for use with students, hands-on activities to use with students, and monthly lesson plans for teachers to follow so that they were up to date on what students were doing in their general classroom as well as in their small math group. The reference notebook was presented to teachers to show them what it contained as well as how to access certain technological ideas to use with students.

This professional learning community will continue to meet throughout this year in hopes of brain storming techniques to be introduced to students in a consistent manner, but also will promote engagement, motivation, and focus among struggling math students. (Appendix G- contains minutes from the Professional Learning Community Meeting).

Action Plan

After completing this research project, it is evident that by providing engaging, interactive, and hands-on methods of teaching to struggling math students, they will, in turn, be more motivated to succeed, their work habits have increased positively, and they are more focused in learning, while they prove also to be more successful in learning mathematical content. Previous to the research project, I believed in direct teaching and modeling for teaching of mathematics. From my experience, research and data gathering, I have learned and feel empowered to teach others who instruct students who are lower performing and who struggle with focus and motivation across the curriculum, it is important to target teaching methods to best suit their needs. Interest surveys are one way of gathering information about students, but through observation and anecdotal records, more useful information can also be obtained. Truly knowing students, their interests, and how they best learn creates the most successful learning environment for.

This project has already turned into a professional learning community for my colleagues and me. I plan on continuing this process in my building by having further meetings and attending more professional development seminars to learn more about up-to-date methods that will motivate and increase focus among lower performing students. I will present this information to other staff members who work with these struggling students in hopes that by presenting mathematical information multiple times to struggling students in various engaging ways, these students will increase in their self-confidence, which will thus impact their motivation and focus in mathematics.

Appendix

A.

Research Questions	1	2	3
What learning strategies will increase focus and good work habits?	Student Goals	Student Interview	Colleague Collaboration
What is the effect on students' focus and motivation when different opportunities are provided?	Student Interviews	Anecdotal Records	Test Scores
What teaching practices and strategies could improve student motivation, focus and the learning of mathematical concepts?	Student Journal Observation	Student Survey	Professional Learning Community

The data collection matrix represents the research questions to be considered during the action research plan. For each question, three different methods will be used in order to obtain information. From these results, specific teaching practices will be applied in order to best suit the needs of students. As Mills' (2010) states in (2011) *Action Research: A guide for the Teacher Researcher*, "teachers have always reflected in their teaching before, during, and after a particular teaching episode-it's part of our professional disposition. Action research is no different. We can and should take time to analyze our data during the study to decide if what we are learning is what we had hoped to learn" (p.124). From using professional learning communities, as well as personal colleague interviews, and incorporating research driven practices it is the goal that these different methods will serve as a reflection upon current

teaching practices and will either change in ways to best meet the needs of students, or will be modified in order to meet the goals of the action research plan.

The first research question will require gathering data from student goals, student interviews, and information discussed in colleague collaboration. The students will write personal goals at the beginning of the year. These goals will be guided and modeled through a brainstorming activity. They will be recorded in a student notebook. Students will set a learning goal for themselves and will check in with their progress of the goal periodically to see how they have progressed. Students will discuss their goal with me, in a student interview, and will decide how they are progressing on their goal throughout the year. Finally, colleague collaboration will occur with the third grade general education teachers. This is to gain further ideas about students and how they best learn. Also, thoughts can be shared among colleagues for teaching methods and practices that have been both positive and negative for students and their learning.

For research question two, showing the difference in providing engaging learning opportunities as opposed to just modeling and independent learning, using raw data scores on math assessments will be necessary. This is because in order to show improvement over time when providing different learning opportunities, it must be evident in the overall math assessment scores as compared to times of learning when these opportunities were not provided. Teacher observation will be conducted during learning and these observations will be recorded in a teacher notebook for summarization at a later time. This will be beneficial to note the differences in students' learning when engaging opportunities are provided. Finally, student interviews will be given to determine why specific learning opportunities are positive experiences for students and also to gain "on-the-spot" answers from students.

Research question three will require results gained from the student survey as well as observations of the student math journal. Students will write in their math journal at varying times throughout their learning. Summaries of these journals (written in the teacher notebook) will be necessary in order to understand students and their initial experiences following a lesson. The student survey will also provide student opinions about math and ways in which math is best learned for each student. Lastly, a professional learning community discussion will occur with the instructional specialist, to discuss findings at the math workshop conference, as well as other ideas that may be used with students to increase motivation and focus in math. Ideas will also be shared with teachers who also work with the target group of students in a before school program called GPAS (Greenfield's Program for Academic Success). This meeting is meant to help to coincide teaching methods in both the small group math class time, as well as during their GPAS class. This way students will be introduced to the same content multiple times, in multiple ways.

As Dorothy Korzum tells us in the *Expert Commentary Teachscape Video: Data Analysis and Interpretation*, “data analysis and interpretation is the most cumbersome and challenging part of the action research project. This is the time where you must “look for patterns, and themes, and find ‘the what’ of your data analysis.” From the information gained through the student surveys, student notebooks, interviews, colleague collaboration, teacher notebook, math scores, and professional learning communities, the answers will be useful in obtaining information about how students best learn, what their strengths and weaknesses are in math, as well as how I can best teach students according to their needs. In creating another matrix similar to Appendix C (p. 236) in Mills’ (2011) *Action Research: A guide for the Teacher Researcher*, and using color coded highlighting in the matrix to identify changes in attitude over time in student surveys and parent surveys, results can be obtained regarding patterns and themes over

time. This is why it will be crucial to not only offer the survey to students at the beginning of the year, but at the mid-year time, and again at the end of the year. Also, scores on math assessments can be recorded on a bar graph to show an increase or decrease in scores according to the application of engaging learning techniques versus just teacher modeling and independent practice. This way, it will be understood if practices have been beneficial to students and their learning of mathematics.

Interpreting scores will be evident through a bar graph, and through observation of students. If students are performing well on assessments, then their morale and self-confidence will be higher, and thus they will be more motivated and focused during instruction. It is the hopes of providing engaging learning opportunities as well as using student surveys and interviews, colleague collaboration, student notebooks, and anecdotal summaries completed in a teacher notebook, to understand interests and personal aspects of students to best reach them and their potential for learning. Understanding that this is the hardest and most challenging part of the action research project, it is going to be a trying process, but through careful planning and deliberate use of methods explained above, the action research questions will be answered, supported with proper data, and organized for best understanding of data collected.

Appendix

B.

Student Survey

Name _____	Date _____	Time _____
About My Math Class A		
Draw a face or write the words that show how you feel.  		
Good	OK	Not so good
1. This is how I feel about math: Why?	2. This is how I feel about working with a partner or in a group: Why?	3. This is how I feel about working by myself: Why?
4- This is how I feel about solving number stories: Why?	5- This is how I feel about doing homework: Why?	6- This is how I feel about finding new ways to solve problems: Why?
Circle your answer.		
7. I like to figure things out. I am curious. yes sometimes no		
8. I keep trying even when I don't understand something right away. yes sometimes no		
9. I do my math homework: by myself with help from someone at home		

My Feelings About Math- Part 2

Circle the word that best describes how you feel.

- | | | | |
|--|-----|-----------|----|
| 1. I enjoy mathematics class. | yes | sometimes | no |
| 2. I like to work with a partner
or in a group. | yes | sometimes | no |
| 3. I like to work by myself. | yes | sometimes | no |
| 4. I like to solve problems
in mathematics. | yes | sometimes | no |
| 5. I enjoy doing math homework. | yes | sometimes | no |

6. In math, I am good at _____

7. One thing I like about mathematics is

9. One thing I find difficult in mathematics is

10. My favorite activity, project or math concept that I have learned was _____. It was my favorite because _____.

Other thoughts about math.....

How can I as your teacher help you to be successful in math?

How do you best learn? Circle as many as options that apply to you. ☺

From watching and listening to the teacher do a problem

From working with a partner

From using manipulatives

From using what I already know

Appendix

C.

Student Summaries of Goals- September 2011

Pretest 50 Multiplication Problems September 2011

Post Test 50 Multiplication Problems November 2011

JB- "I wish to learn multiplication by heart. I wish to practice math more." - Pre-60% -Post-85%

FJ- "I want to do multiplication in one minute. Do division faster. Do addition without counting on my fingers." – Pre-85%- Post- 92%

TL- "Do better on my tests, and multiplication." Pre-40%- Post- 76%

GT- "Work on my times facts, inches, story problems, and my test scores." Pre -45%-Post-72%

IM- "Do my multiplication and division facts in five minutes." Pre- 87%- Post-90%

EF- "Doing multiplication better and faster, and trying harder on my tests." Pre-60% Post- 89%

Appendix
D.
Summary of Student Goals

All students' goals are focused on basic math facts (multiplication). We will be working on these weekly during class time. Interactive activities will be completed to increase motivation for learning these facts. The fact that students are motivated enough to write a goal statement about improving in this area tells me that they will in turn be motivated to learn their facts to improve and reach their goal. Two out of six students (33%) wanted to improve on their tests, which also tells me that they are motivated to improve on their test taking skills. Students were given a pretest of multiplication facts (50 Problems). This was to determine a baseline for their fact knowledge at this time. Their scores on the pretest are listed next to their goal statement.

Their post -test score is also given. This test was given in early November. 100% of the target group has improved on their math facts. Which means that 100% of the target group has successfully improved on their desired goal statement. Students were motivated through activities that were presented to them in interactive ways. This was determined from looking at various data tools conducted with students (student interview information, notebook observation, anecdotal records, student surveys). Focus and motivation have improved in the area of basic math facts (mainly multiplication).

Appendix

E.

Colleague Collaboration List of Strategies to Use with Students

1. Prometheanplanet.com-Download lessons for interactive Promethean board.
Children can participate in activities on the board.
2. Musical activities- wrap up manipulatives for math facts with CD that recites the song, Schoolhouse rock songs for multiplication facts, creating rhymes for memorization of multiplication facts.
3. Create books using stamps, markers, folding paper to allow for creative aspects of showing problems/methods of solving problems. (RTI workshop idea)
4. Use manipulatives as much as possible with students. Place value- base 10 blocks, counters for multiplication, wrap ups for multiplication, pattern blocks, fraction sticks etc.
5. Allow for exploration through partner work and collaboration. Allow for discussion of concepts and use math notebook to solve and plan out problem solving.
6. Use technology based programs to help with engagement and focus. (Everyday Math Games online, Math Fact Café.com.)

Appendix
F.
Student Interview Checklist

Name _____ Date: _____

_____ I enjoy using the Promethean board.

_____ I like to participate in math class when the Promethean board is used.

_____ I enjoy being able to use music to help me with math.

_____ I think using music has helped me improve in my memorization of my math facts.

_____ I like doing partner work where I can explore math ideas with a classmate.

_____ I like using my math journal to help me write out solutions and how to solve problems.

_____ I enjoy using technology to help me with math.

_____ I think my overall focus has improved through learning these ways.

_____ I like being able to explore math problems rather than just sit and listen about to how to do math problems.

_____ I like when the teacher just explains how to do math, and then we are able to do our work.

_____ I think my focus is good in math.

_____ I think I am trying my hardest with math.

_____ I think I could be trying harder with math.

_____ I think I am doing better on my math tests because I am enjoying learning math more.

Math Unit Test Scores: 1. _____ 2. _____ 3. _____ 4. _____

Appendix G

Professional Learning Community Meeting Minutes



Thank you for attending the G-PAS math meeting today. There were many ideas, suggestions, and input given, and we really appreciate the dialogue that we were all able to have.

Here are some key elements that when continuing our program we would like to focus on:

- Please use the reference binder as a guide to your lesson planning with students
- Further lesson plans will be emailed or put in your mailbox for skills that we could continue to work on throughout the year
- Communicate with Alison Bacon for needs for G-PAS (manipulatives, materials) as well as for needs you may have for student information

It is important to keep documentation of students and their progress in G-PAS. Some examples of documentation would include:

- Graded Unit tests (will be given to you from classroom teachers or Alison Bacon)
- G-PAS teacher created tests (can be small -3-4 questions)
- G-PAS teacher developed pre/post tests
- All other work done by the student in G-PAS
- Document the skill you are working on, the date(s) you have worked on it, and keep student work for your file

- Include fact practice into your daily routine, which can be five minutes or longer depending on what you would like to do.
- Use websites, and other creative ideas for fun ways of learning math, and engaging your students! ☺

Thank you so much for all you do! It is very evident that you are dedicated to working with your students, and are trying your best to provide them with the skills they need in math to succeed.

Alison Bacon
&
Shelly Potter

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